

CLAIMS

1. A method for determining the binding affinity between an object and a surface comprising:
 - affixing at least one object to a surface;
 - applying a force to at least one object on the surface to remove at least one object that has a relatively low binding affinity to the surface;
 - monitoring the force applied to at least one object; and
 - calculating the binding affinity between at least one object and the surface from the force applied to remove at least one object.
2. The method of claim 1 wherein the scanning probe microscope is an atomic force microscope.
3. The method of claim 1 wherein the force is applied to at least one object using an atomic force microscope.
4. The method of claim 1 further comprising collecting at least one object removed from the surface by the applied force.
5. The method of claim 1 further comprising scanning the surface again to locate at least one object on the surface.
6. The method of claim 5 further comprising
 - (a) scanning the surface using an increased applied force; and
 - (b) collecting those objects that are removed by the increased force.
7. The method of claim 6 further comprising repeating steps (a) and (b) wherein the applied force is sequentially increased.
8. The method of claim 6 further comprising harvesting at least one object from the surface.

9. The method of claim 6 wherein at least one object is selected from the group consisting of proteins, nucleic acids, antibodies, cells, viruses, and phage particles.

10. A method for determining a binding affinity between an object and one or more materials comprising:

obtaining a surface, the surface further comprising one or more materials deposited thereon;

affixing at least one object to be studied to the one or more materials deposited on the surface;

applying a force to at least one object to remove at least one object; and

calculating the binding affinity between the object and the corresponding material from the force applied to remove the object.

11. The method of claim 10 further comprising monitoring the force required to remove the object from the corresponding material.

12. The method of claim 10 further comprising scanning the surface with a scanning probe microscope to locate at least one object.

13. The method of claim 10 wherein scanning the surface and applying the force to at least one object is accomplished in a liquid medium

14. The method of claim 11 further comprising collecting at least one object removed from the corresponding material.

15. The method of claim 10 further comprising:
applying an incrementally increased force to at least one object; and
collecting at least one object that is removed by the increased applied force.

16. The method of claim 15 further comprising harvesting at least one object remaining on the surface.

17. The method of claim 10 wherein the binding affinity interactions are molecular interactions.
18. The method of claim 10 wherein the binding affinity determined involves protein interactions.
19. The method of claim 10 wherein the binding affinity determined involves nucleic acid interactions.
20. The method of claim 10 wherein the binding affinity determined involves antibody/antigen interactions.
21. The method of claim 10 wherein the binding affinity determined involves receptor/ligand interactions.
22. The method of claim 10 wherein the binding affinity determined involves cell/cell interactions.
23. The method of claim 10 wherein the binding affinity determined involves cell/substrate interactions.
24. The method of claim 10 wherein the binding affinity determined involves virus/virus interactions.
25. The method of claim 10 wherein the binding affinity determined involves virus/substrate interactions.
26. A method for assessing the interaction force between an object and a surface comprising:
depositing at least one material on a surface;
affixing at least one object to the material deposited on the surface;

scanning the surface with an atomic force microscope to locate at least one object affixed to the surface;

applying a force to at least one object with the atomic force microscope, the force being determined by the user and some of the objects being removed from the surface by this force;

scanning the surface to locate the at least one object that is still affixed to the surface;

applying a second greater force to the at least one object on the surface using the atomic force microscope; and

collecting at least one object still affixed to the surface.

27. A method of determining the binding affinity between an object and a surface comprising:

- (a) depositing one or more objects on a surface
- (b) scanning the surface with an atomic force microscope to locate the objects on the surface;
- (c) applying a first force to at least one object on the surface with the atomic force microscope to remove at least one object from the surface that has a relatively low binding affinity;
- (d) collecting at least one object that has been removed from the surface by the first force;
- (e) applying a second, greater force to at least one object using the atomic force microscope to remove at least one object from the surface that has a relatively low binding affinity;
- (f) collecting at least one object that has been removed from the surface by the second force; and
- (g) repeating steps (b) through (f).

28. A method of determining the binding affinity between an object and a material deposited on a surface comprising:

- (a) depositing at least one material on a surface;
- (b) binding at least one object to at least one material;
- (c) applying a first force to at least one object on the surface with an atomic force microscope;
- (d) collecting at least one object that has been removed from the surface by the first force;
- (e) applying a second force to at least one object on the surface using the atomic force microscope to remove at least one object from the surface;
- (f) collecting at least one object that has been removed from the surface by the second force; and
- (g) repeating steps (b) through (f).

29. The method of claim 28 further comprising calculating the minimum binding affinity between the object and the object and the material deposited on the surface from the applied force.

30. The method of claim 28 wherein the objects are deposited using non-specific binding interactions.

31. The method of claim 28 wherein the objects are deposited using covalent binding interactions.

32. The method of claim 28 wherein the objects are selected from one or more of the group consisting of proteins, nucleic acids, antibodies, cells, or viruses.

33. The method of claim 28 wherein the interaction force is between an antibody and an antigen